MEGALOSAURIDS FROM THE BAJOCIAN (MIDDLE JURASSIC) OF DORSET

by MICHAEL WALDMAN

ABSTRACT. A new megalosaurid, *Megalosaurus hesperis* sp. nov., is described from the Upper Inferior Oolite (Bajocian) of Dorset; the type material was previously assigned to *M. bucklandi*. The holotype of *M. nethercombensis* von Huene, 1923, from the Middle Inferior Oolite of the same county, is redescribed; von Huene's proposal of a new genus (*Magnosaurus* 1932) for this species was unjustified. *Sarcosaurus andrewsi* is transferred to the genus *Megalosaurus*.

AMONG the many reptilian remains recovered from the Middle Jurassic strata of Dorset (Delair 1958, 1959, 1960, 1966) are two sets of megalosaurid bones. These were partially prepared by the author in 1964–1965, with the permission of the British Museum (Natural History) and Oxford University Museum.

One of these specimens (R.332) has long been referred to *Megalosaurus bucklandi* by various authors, and it was only in 1964 that Walker first commented in print on the disparity in tooth-count between R.332 and *M. bucklandi*. Tooth-counts are a good diagnostic feature in the carnivorous saurischians, and the material is, therefore, redescribed and specifically separated from *M. bucklandi*.

The second specimen (O.U.M. J.12143) consists of a few rather ill-preserved post-cranial elements and an associated pair of dentaries. The latter had to be freed from matrix before any description could be undertaken. There is no doubt that the material represents a separate species of *Megalosaurus*, *M. nethercombensis*, as noted by von Huene. It may also belong to a juvenile individual.

Since most of the Middle Jurassic sediments in this country are at least partially marine in origin these remains of terrestrial reptiles are significant in establishing that at least three species of *Megalosaurus* existed at that time in what is now the United Kingdom.

Nomenclature. The generic name *Allosaurus* is used in preference to *Antrodemus* (Matthew and Brown 1922). Both names probably refer to the same animal, but this remains unproven.

Abbreviations. O.U.M. or J. = Oxford University Museum.
B.M.(N.H.) or R. = British Museum (Natural History).
N.M.C. = National Museum of Natural Sciences, Ottawa, Canada.

SYSTEMATIC DESCRIPTIONS

Order SAURISCHIA
Suborder THEROPODA
Infraorder CARNOSAURIA
Family MEGALOSAURIDAE

Note. For recent discussions and diagnoses of the above taxa, reference may be made to Colbert (1964), Walker (1964), and Charig, Attridge and Crompton (1965).

Genus *Megalosaurus* Buckland, 1824

Diagnosis. Twelve to thirteen teeth in maxilla and dentary, tooth carinae positioned anteriorly and posteriorly, not obliquely. Dentary straight, with symphysial facet. Vertebrae short; scapula large, with anterior expansion of middle part of blade; humerus stout; pubis with small distal thickening, extensive symphysis, no foot; ischium down-curved posteriorly; femur massive, lesser trochanter placed well down shaft; tibia stout, 83% of femur (maxima of non-associated bones). (Diagnosis after Dr. A. D. Walker, personal communication, with minor additions by the author.)

Type species. Megalosaurus bucklandi von Meyer, 1832.

Megalosaurus hesperis sp. nov.

Plates 42, 43

1883 *Megalosaurus bucklandi* von Meyer; Owen, p. 334, pl. XI.
1884 *Megalosaurus bucklandi* von Meyer; Owen, p. 166, pl. LXXXVII.
1890 *Megalosaurus bucklandi* von Meyer; Woodward and Sherborn, p. 249 (*pars*).
1926*a* *Megalosaurus bucklandi* von Meyer; von Huene, p. 37, item 14.
1932 *Megalosaurus bucklandi* von Meyer; von Huene, p. 220 (*pars*).
1934 *Megalosaurus bucklandi* von Meyer; Swinton, pp. 214–215 (*pars*).
1959 *Megalosaurus bucklandi* von Meyer; Delair, p. 78.
1960 *Megalosaurus bucklandi* von Meyer; Edmund, p. 130, fig. 43(k).
1964 '*Megalosaurus bucklandi*' von Meyer; Walker, p. 115.

Diagnosis. A large megalosaurid, fifteen to eighteen maxillary teeth, seventeen or eighteen dentary teeth; only apical part of dentary teeth recurved.

Holotype. B.M.(N.H.) R.332; a right maxilla, parts of both premaxillae, both dentaries, part of the right surangular, part of the ?vomer, and an isolated tooth (Pl. 42, figs. 1–3).

Derivation of specific name. Greek; hesperos—the West, western.

Locality. There appears to be some confusion in the literature with regard to the exact provenance of the *M. hesperis* material. Owen (1883, 1884), and Mansel-Pleydell (1888) did not give exact locations in the Sherborne area, while Buckman (1893) gave the location as: 'Redhole Lane, Sherborne,—(about 1 mile N. of the Abbey).' Edward Cleminshaw, who originally obtained the material, is quoted by Richardson (1916) as stating: 'The site of the quarry in which the remains were found is very near the back of the houses on the north side of Cold Harbour Road, . . .' It is evident from Richardson (1932) and the *Directory of British Fossiliferous Localities* that these locations do not coincide, and as Cleminshaw secured the material [although not its discoverer (Richardson 1916)] I have no reason to doubt his statement of the provenance of the specimen.

Horizon. Upper Inferior Oolite, *Parkinsonia parkinsoni* Zone, *Garantiana garantiana* subzone; Bajocian, Middle Jurassic. (Stratigraphy according to Wilson *et al.*, 1958.)

EXPLANATION OF PLATE 42

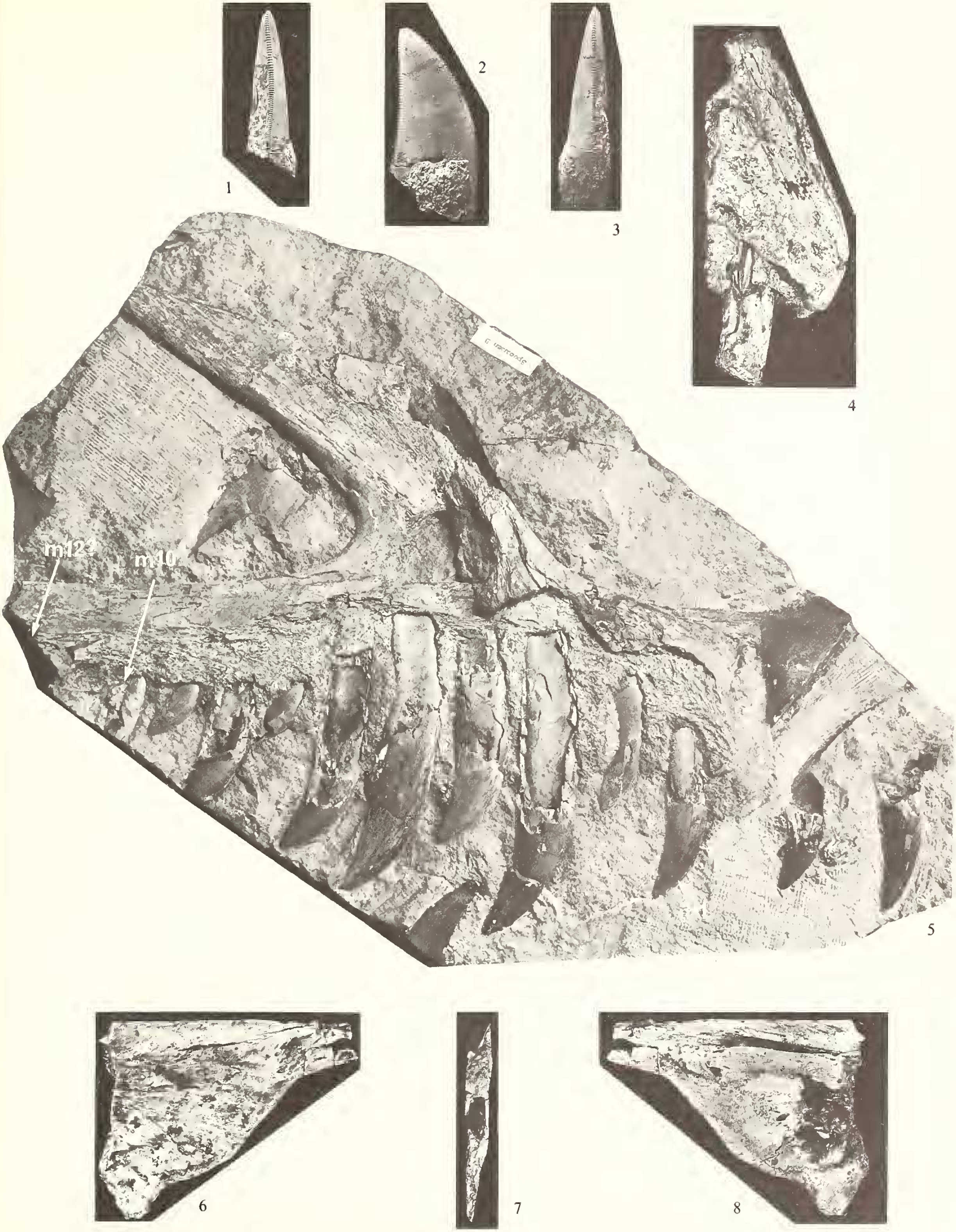
Figs. 1, 2, 3. Posterior, lateral, and anterior views of a tooth of *Megalosaurus hesperis*. B.M.(N.H.) R.332. Natural size.

Fig. 4. Lingual view of part of the left premaxilla of *M. hesperis*. B.M.(N.H.) R.332, ×0·5.

Fig. 5. Buccal view of right maxilla and partial premaxilla of *M. hesperis*. B.M.(N.H.) R.332, ×0·3. Arrows indicate premaxillary teeth.

Figs. 6, 7, 8. Buccal, posterior, and lingual views of the anterior part of the right surangular of *M. hesperis*. B.M.(N.H.) R.332, ×0·5.

Note. Numbers prefixed by 'm' indicate maxillary teeth, numbering from the anterior.



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Description. The right maxilla (Pl. 42, fig. 5) is represented on two facing slabs and was first described by Owen (1883). The posterior and anterior margins of the maxilla are broken, but the ascending process is well preserved for much of its length. The maxillary–premaxillary junction is visible, although heavily plastered. Twelve maxillary teeth are preserved (Walker 1964) and comparison with *Allosaurus* tends to confirm Walker's (1964) estimate of fifteen to eighteen teeth for the whole maxilla. These teeth differ little from those of *Megalosaurus bucklandi.* The maxilla was used by Edmund (1960) to illustrate the mode of tooth replacement in that species and by von Huene (1926*a*) in his 'construction' of the skull of *M. bucklandi.* The teeth are large and very deeply set in the maxilla, almost reaching the level of the ventral margin of the second antorbital fenestra. The serrations on the posterior carinae are all perpendicular to the long axis of each tooth, but obliquely set serrations are visible on some anterior carinae.

The general shape of the maxilla is clearly seen in Pl. 42, fig. 5. At the second antorbital fenestra the process is compressed, presumably for contact with the nasal and lachrymal elements (cf. Gilmore 1920). A pronounced vertical groove is present between maxilla and premaxilla, probably for the admission of the crown of a large dentary tooth (Walker 1964).

Four premaxillary teeth are visible, two being preserved as crowns, one as a cross-section of its original position, and one as an imprint of a juvenile tooth. A cross-section of another ?extraneous tooth is also present immediately below the imprint. Walker (personal communication) has commented that there may have been five teeth in the premaxilla, as in *Allosaurus*, both genera having a similarly high maxillary tooth count. Only the postero-dorsal region remains of the right premaxilla, although the rest of the bone has been cast in plaster from the premaxillary impression on the opposing slab. The left premaxilla (Pl. 42, fig. 4) is broken away posteriorly and only the first two alveoli are preserved, but even so there is a marked resemblance to the premaxilla of *Allosaurus* (Gilmore 1920). The lingual face for contact with the opposite premaxilla is flat, apart from a large shallow, neural groove which runs antero-ventrally. The first alveolus is empty, but the second reveals a large tooth lacking the crown, with a well-preserved replacement tooth lying lingually. Part of the imprint of the third premaxillary tooth is also present. Remains of interdental plates are preserved, separated from the sutural surface of the premaxilla by a deep blood-vessel groove and a bony parapet which curves in toward the second alveolus. Above the second interdental plate there is a circular foramen which runs dorsally. The antero-ventral face of the premaxilla is pitted with minute foramina close to the mid-line, and four larger foramina are present at a little distance from the latter. The nasal process of the premaxilla is broken off close to its base, but is seen to ascend postero-dorsally and to possess a concave posterior margin. Ventral to this concavity there is a single foramen, directed anteriorly.

The lower jaw (Pl. 43, figs. 1–3) is represented by paired dentaries and part of the right surangular. The right dentary, which is the more complete, contains thirteen alveoli, but the full complement is estimated to have been seventeen or eighteen. The dentaries are slenderly built by comparison with *M. bucklandi* and are narrow in cross-section relative to their length. The third alveolus is the largest and probably bore the tooth received by the premaxillary-maxillary groove. The height of the buccal wall reaches its maximum at the level of the third and fourth alveoli. Small, poorly preserved interdental plates are present, but the blood-vessel groove running along their bases is well preserved, and considerably deepened anterior to the fifth alveolus. A shallow longitudinal groove is present on the lingual face but is broken away at the level of the third alveolus. Below this groove there is a sharp-edged ridge, slightly convex dorsally, which extends from the level of the posterior margin of alveolus nine to that of alveolus six. At the emergence of the Meckelian canal from the dentary the ridge extends into the vacuity as a V-shaped fork, probably for articulation with the anterior part of the splenial. The ventral prong of the fork extends posteriorly, although partially broken, and has longitudinal rugosities on the postero-dorsal surface.

Five adult teeth are present in alternate alveoli beginning with the second, and all these alveoli bear successional teeth except alveolus ten. Replacement teeth are also present in alveoli three and five, the latter tooth being a hollow shell. In common with other carnosaurs all the adult teeth have hollowed out lingual faces where the successional teeth are already appearing (Lambe 1917). Crypts are present on the lingual walls of the alveoli where the successional teeth develop before erupting into the alveoli. Alveolus ten is an excellent example of such a crypt, being laid open to view from the buccal face.

The left dentary is damaged, lacking much of the anterior and posterior regions and most of the buccal surface. The beginning of the forked articulation with the splenial is just visible and the interdental blood-vessel groove is well preserved. This groove deepens at the same point in each dentary, at the level of the centre of alveolus four. A similar situation was noted by Osborn (1912) in the dentary of *Tyrannosaurus* and may be a mechanism to ensure vascular protection near the front of the jaw. The alveoli show little of note, except that alveolus nine possesses three teeth in vertical succession, the smallest of which exhibits a remarkably well-preserved posterior carina, visible through a break in the posterior wall of the alveolus.

The anterior wing of the right surangular (Pl. 42, figs. 6–8) is a thin, lamellar element, but above the deep longitudinal groove for articulation with the posterior portion of the dentary it is somewhat thickened. The ventral margin of the surangular is sinuous but the dorsal rim is almost straight and the tip of the very thin anterior process to the dentary is broken off. No foramina of any kind are present in this wing of the surangular. During preparation of the block containing the right dentary, left premaxilla and right surangular, a portion of a median skull element was recovered (Pl. 43, figs. 4–6). The bone is bilaterally symmetrical, laterally compressed, and is apparently the product of two fused elements. Two broad, thin flanges form a deep cleft, the flanges tapering rapidly into a flattened bar, with remnants of the cleft forming a long groove on one margin. The opposite edge of the bar is broken, but probably only a little more bone was present originally.

Two feasible suggestions have been made concerning this element. The late Professor A. S. Romer and Dr. A. D. Walker (separate personal communications) have suggested the possibility of it being a part of the presphenoid, whereas Dr. D. A. Russell (personal communication) has proposed it to be a broken vomer. Neither of these elements is particularly well known in carnosaurs, but there is a resemblance to a vomer of a large tyrannosaurid in the N.M.C. collection (*Daspletosaurus torosus*;

N.M.C. 8506). In lateral view the specimen resembles the parasphenoid rostrum of *Dromaeosaurus* (Colbert and Russell 1969) but the very deeply cleft structure of the *M. hesperis* element is unlike that of *Dromaeosaurus*. Of the two suggestions put forward it seems more likely that the element is part of the vomer.

Remarks. The material described must be specifically separated from *M. bucklandi*, as the tooth-count in both upper and lower jaws is widely different from that of the latter. Further comparisons are obviously impossible at the moment due to lack of material. From Table 1 it is evident that *Allosaurus*, *Proceratosaurus*, and '*Zanclodon*' *cambrensis* closely approach *M. hesperis* in numbers of teeth. The form and disposition of the dentition and general jaw morphology of *Proceratosaurus* (Woodward 1910; von Huene 1926*a*, *b*) are sufficiently distinct, however, to preclude it from close relationship with either *M. hesperis* or *Allosaurus*.

TABLE 1. A comparison of tooth counts in some theropods.

	No. of premaxillary teeth	No. of maxillary teeth	No. of dentary teeth
Megalosaurus hesperis	4+	15–18	17–18
Allosaurus	5	15–17	15–16
Megalosaurus bucklandi	?	12–13	12–13
Eustreptospondylus	4	9+	?13
Tyrannosaurus	4	12	14
Ceratosaurus	3	15	15
Albertosaurus (*sensu* Russell 1970)	4	13–15	14–16
Proceratosaurus	4–?5	18	?18
'*Zanclodon*' *cambrensis*	?	?	16–?17

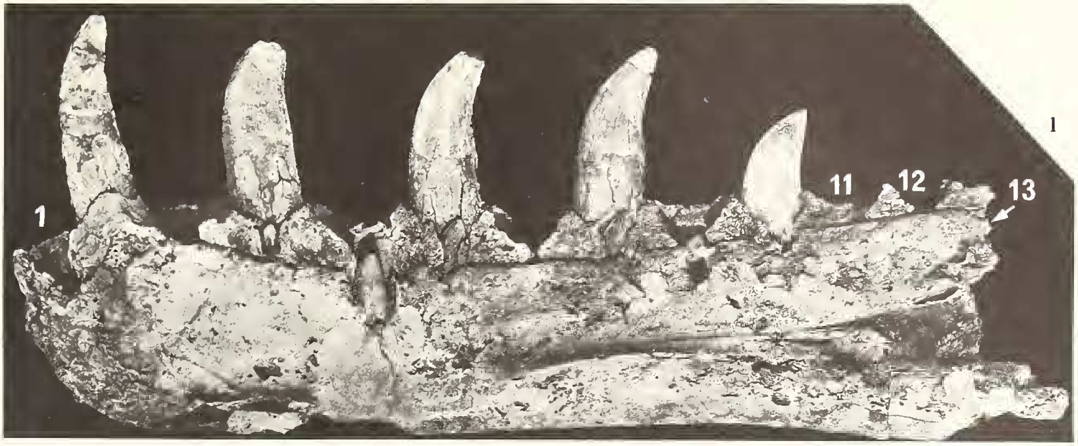
In occlusal view the dentaries of *Allosaurus* exhibit a marked curvature, becoming strongly convex toward the symphysis. As if to accentuate this curvature the anterior carina of the anterior teeth is placed lingually and the posterior carina is displaced slightly towards the buccal face. The dentaries of *M. hesperis* show no indication of such longitudinal curvature, apart from a slight convexity to house the large second and third alveoli; and the tooth carinae remain on the anterior and posterior margins. Although many carnosaurs do not possess 'a definite symphysial area' (Walker 1964) specimens of *Allosaurus* from the Upper Jurassic Morrison Formation, Cleveland Quarry, Utah, U.S.A., in the N.M.C. collections have a definite facet at the symphysis. This would have formed a very flexible and elastic type of articulation, and is interesting in view of Gilmore's (1920) statement that there is '. . . no indication of a symphysial surface . . .' at the anterior margin of the dentary. No such facet is present in the mandible of *M. hesperis*.

EXPLANATION OF PLATE 43

Figs. 1, 2, 3. Lingual, buccal, and occlusal views of the right dentary of *M. hesperis*. B.M.(N.H.) R.332, ×0·5.

Figs. 4, 5, 6. Dorsal, lateral, and ventral views of the vomer of *M. hesperis*. B.M.(N.H.) R.332. Natural size.

Numbers indicate dentary teeth, numbering from the anterior.



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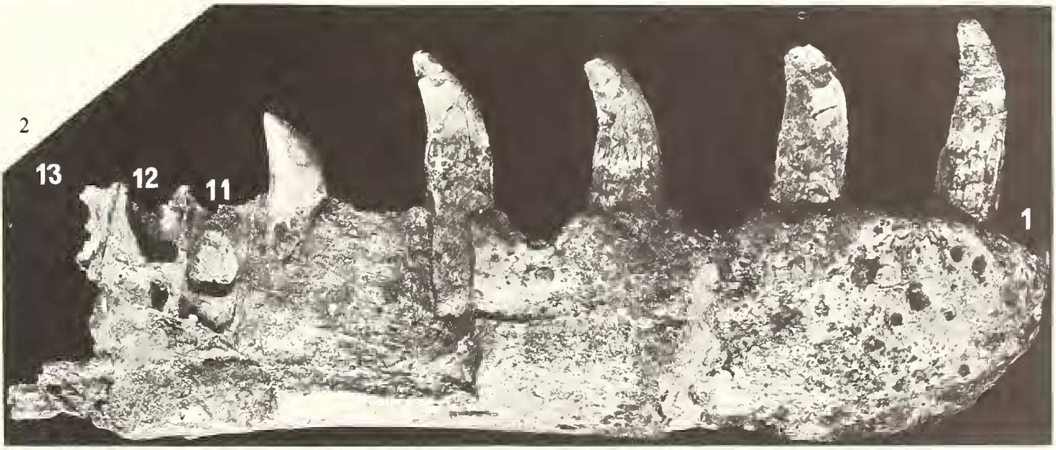

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6

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TABLE 2. Comparison of certain features in the dentaries of some theropods. Abbreviations: a.c., Anterior carina; p.c., Posterior carina.

	Shape of dentary in occlusal view	Symphysial facet	Position of tooth carinae
Megalosaurus hesperis	Straight	Absent	Posterior and anterior
Allosaurus	Well curved	Present	a.c. moved lingually on anterior teeth; slight buccal displacement of p.c.
Albertosaurus	Straight	Absent	Posterior and anterior; ventral part of a.c. deflected lingually
Megalosaurus bucklandi	Straight	Absent	Posterior and anterior
Megalosaurus nethercombensis	Straight	Absent	Posterior and anterior

Table 2 illustrates the apparently aberrant character of the lower jaw of *Allosaurus* when compared with other theropods. Such comparison is limited to those genera which I have examined, and, therefore, *Ceratosaurus nasicornis* is omitted. It may be pertinent to note, however, that to judge from Gilmore (1920, pl. 17, fig. 2) the left dentary of *Ceratosaurus* is curved toward the symphysis in similar fashion to that of *Allosaurus*. Gilmore (1920) also stated that he could not distinguish between the teeth of *Ceratosaurus* and *Allosaurus*, and referred to '. . . the same placing of the carina . . .'. It may well be, therefore, that *Ceratosaurus* and *Allosaurus* are the only two large carnivorous dinosaurs from either North America or Europe which possessed curved dentaries and anterior teeth with lingual anterior carinae.

The part of the surangular preserved in *M. hesperis* bears a close resemblance to that of *Allosaurus* (Gilmore 1920) and a tyrannosaurid, *Daspletosaurus torosus* (Russell 1970). The small foramen present in the mid-anterior part of the surangular of *Allosaurus* is not present in *M. hesperis*.

Despite the large number of teeth in each genus I do not believe there to be a close relationship between *M. hesperis* and *Allosaurus*. I base this statement on the great mandibular curvature and tooth carina positions of the latter, which seem to deny relationship with any known British carnosaur.

Although the systematics of Triassic 'carnosaurs' are in a state of confusion due to incomplete and possibly incorrectly associated material (for clarification see Walker 1964; Charig, Attridge and Crompton 1965) one particular specimen may be of relevance to the present study. This is the left dentary from the Rhaetic of Bridgend, Glamorganshire, South Wales, described as *Zanclodon cambrensis* by Newton (1899) and referred to '*Plateosaurus*' *cloacinus* Plieninger by von Huene (1908). As Walker (1964) pointed out, von Huene (1908) stated that the name *Zanclodon* must be reserved for the original specimen described by Plieninger (1846), which lacked serrations on the teeth. The teeth of '*Z.*' *cambrensis* are very different from those of other species of *Plateosaurus* and it is unlikely to belong to the latter genus. While it is not attempted to classify '*Z.*' *cambrensis* generically, it should be noted that it bears a considerable resemblance to the lower jaw of *M. hesperis*. The jaw of '*Z.*' *cambrensis* is straight and exhibits no true symphysis, although Newton (1899) mentioned 'a slight flattening of the front part of the inner surface'. Newton (1899) stated that the number of alveoli was sixteen or seventeen (von Huene (1908) thought that there were sixteen) which is similar to that of *M. hesperis*. The teeth appear slightly more blade-like, are a little longer-based than those of *M. hesperis*, and seem to lack the pillar-like appearance of the lower part of the teeth of the latter genus, although this may be due to differing degrees of tooth emergence. It seems that the teeth lie in line with the longitudinal axis of the jaw and that the carinae are positioned anteriorly and posteriorly as in megalosaurids and tyrannosaurids, but not as in *Allosaurus*.

The resemblance between the dentaries of *M. hesperis* and 'Z.' *cambrensis* is marked, the only disparity, apart from size, being a very minor difference in tooth-shape. While such a resemblance based on a single, evolutionarily adaptable element is tenuous, it may not be dismissed as being entirely without significance. As skeletal elements closely similar to those of *Megalosaurus bucklandi* are now known from the Lower Lias (Lower Jurassic) of England (Newman 1968) it is reasonable to expect the ancestors of similar species such as *M. hesperis* to be found in beds of similar or slightly greater age.

It is not intended to enter upon the problem of whether a separate family is justified to include *Allosaurus* and its allies, or whether these genera should be placed in the Megalosauridae, but the unusual shape of the lower jaw and high number of teeth of that genus may be regarded by some as evidence in support of a separate family Allosauridae as proposed by von Huene (1932). *M. hesperis* does not appear to be closely related to *Allosaurus*.

Walker (1964) gave a brief résumé of the characters of the family Megalosauridae using *Allosaurus* as typical of that family. In the light of the present description it would seem that *Allosaurus* is aberrant, at least with regard to mandibular form and dentition and is, therefore, unsuitable for use in the diagnosis of the family Megalosauridae.

Megalosaurus nethercombensis von Huene, 1923

Plate 44

1923 '*Megalosaurus*' *nethercombensis* von Huene, p. 450.
1926*a* *Megalosaurus* (subgen. b) *nethercombensis* von Huene; von Huene, p. 72.
1926*b* *Megalosaurus nethercombensis* von Huene; von Huene, p. 477.
1932 *Magnosaurus nethercombensis* von Huene; von Huene, p. 220.
1934 *Megalosaurus nethercombensis* von Huene; Swinton, pp. 214–215.
1959 *Megalosaurus nethercombensis* von Huene; Delair, p. 78.

Diagnosis. A small megalosaurid. Dentary with curved dorsal and ventral margins. Twelve or thirteen dentary teeth, pillar-like in lateral view, recurved occlusally, both carinae serrated. Slender tibia, transverse diameter of head two-thirds of longitudinal diameter; cnemial crest projects anteriorly, small crista lateralis, astragalus with well-developed ascending process. Pubis rod-like, proximal median lamella. (Amended from von Huene (1962*a*, *b*) and Delair (1959).)

Holotype. Oxford University Museum, J.12143, J.12143/1, paired dentaries; J.12143/2, left tibia and fibula fragment; J.12143/3, right pubis; J.12143/6/7, paired femora; J.12143/8, caudal vertebra; J.12143/9b, dorsal vertebra.

Note. This material was collected by (or for) Mr. J. Parker of Oxford and described by von Huene (1923, 1926*a*, *b*, and 1932). Von Huene had seen neither the femora nor one of the vertebrae, and the dentaries were unprepared. In 1932 von Huene based a new genus *Magnosaurus* on this specimen, but Swinton (1934) and Delair (1959) regarded the material as belonging to *Megalosaurus*.

Locality. Nethercomb, 1 mile north of Sherborne, Dorset.

Horizon. Middle Inferior Oolite, *Stephanoceras humphriesianum* zone and subzone; Bajocian, Middle Jurassic. (Stratigraphy according to Wilson *et al*., 1958.)

Description. The dentaries (Pl. 44, figs. 1, 2, and 6), of which the right is the more completely preserved, give an impression of slenderness which is accentuated by their small size. The ventral margin of each is convex anteriorly, curving in a concave arc between the levels of the fifth and tenth alveoli. The dorsal margin follows a similar pattern giving the dentaries a 'waisted' appearance in lateral view. A shallow groove runs anteriorly along the lingual face of the dentary from the splenial-dentary articulation to the anterior margin of the jaw. It traverses two small foramina at the level of the third and fourth alveoli, and beyond these becomes wider and deeper, bearing narrow longitudinal ridges. Apart from this structure the lingual wall of the dentary is smooth and flat. No true symphysis is present but minor rugosites occur lingually in front of the first alveolus, probably for membranous connection.

On the buccal face of the dentary (Pl. 44, fig. 2) a longitudinal groove runs anteriorly to the level of the sixth alveolus, 14 mm below the dorsal margin of the jaw. Anterior to this point the groove is replaced by a row of foramina which parallel the dorsal curve of the jaw and continue on to the ventral margin in the double row, ending in a deep, narrow foramen at the level of the fifth alveolus. There are twenty-three of these foramina on the buccal and ventral portions of the dentary, all of which measure about 2 mm in diameter. Two further foramina, spaced 29 mm apart, continue a slowly ascending trend posteriorly. The interdental plates are fairly well preserved and exhibit a longitudinal blood-vessel groove along their bases. The maximum thickness of the jaw occurs at the level of alveoli two and three, and from that point rearwards the buccal face is shallowly concave, the maximum arc being opposite alveolus seven. The thickness of the dentary increases beneath the longitudinal groove on the buccal face of the dentary.

Eleven alveoli are known in the right dentary and by comparison with dentaries of *Allosaurus*, *Megalosaurus bucklandi*, and some tyrannosaurids it seems likely that a further one or two teeth may have been present posteriorly, bringing the total to twelve or thirteen teeth. The teeth are present for the most part as broken stumps, although several of the replacement teeth are beautifully preserved. The teeth differ

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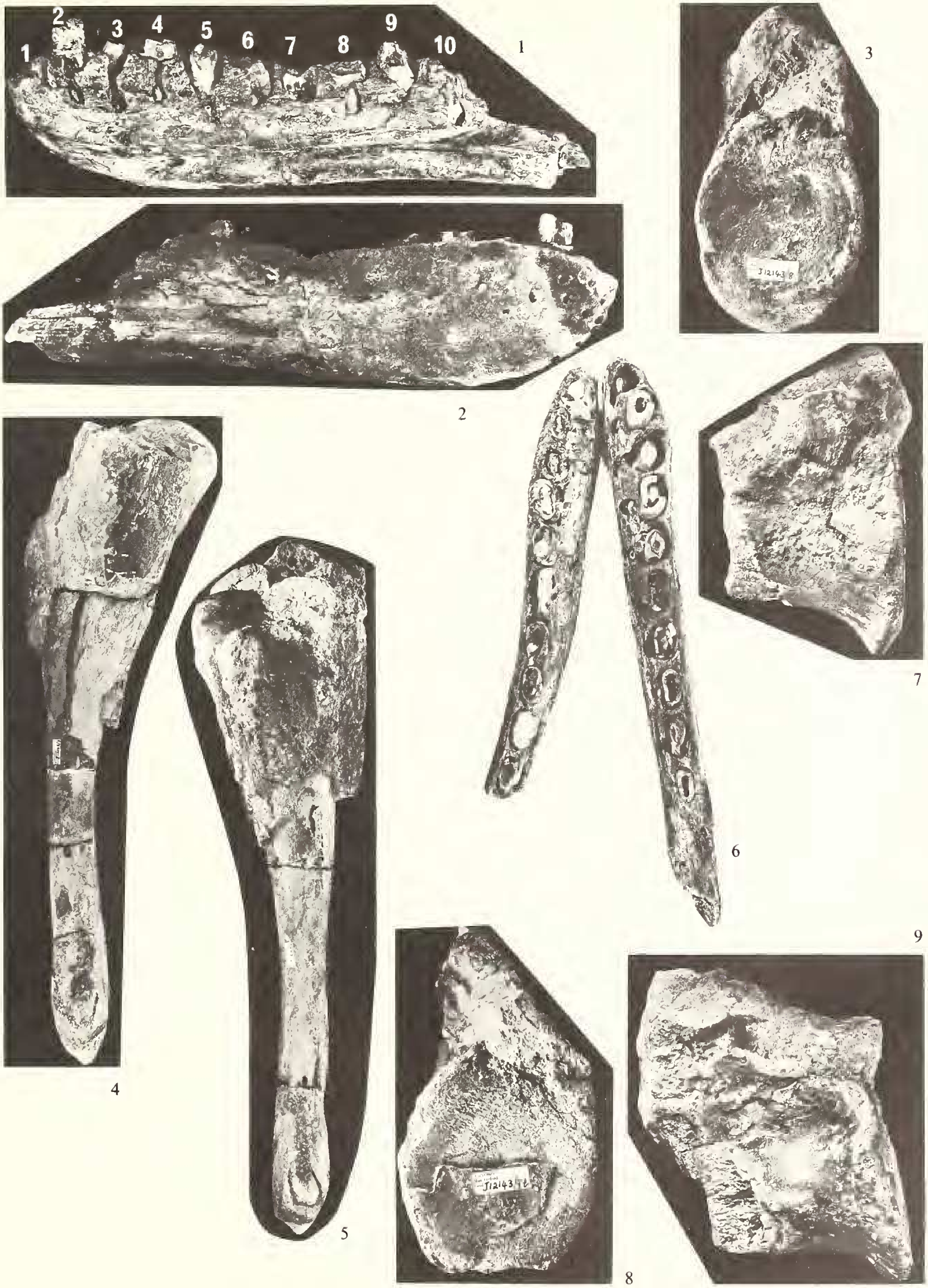
EXPLANATION OF PLATE 44

Figs. 1, 2, 6. Lingual, buccal, and occlusal views of the right dentary of *Megalosaurus nethercombensis*. O.U.M. J.12143/1, ×0·5.

Figs. 3, 7. Sagittal and lateral views of an anterior caudal vertebra of *M. nethercombensis*. O.U.M. J.12143/8, ×0·5.

Figs. 4, 5. Paired femora of *M. nethercombensis*. The femoral shafts are represented by internal calcareous cores. O.U.M. J.12143/6/7, ×0·25.

Figs. 8, 9. Sagittal and lateral views of a posterior dorsal vertebra of *M. nethercombensis*. O.U.M. J.12143/9b, ×0·5.



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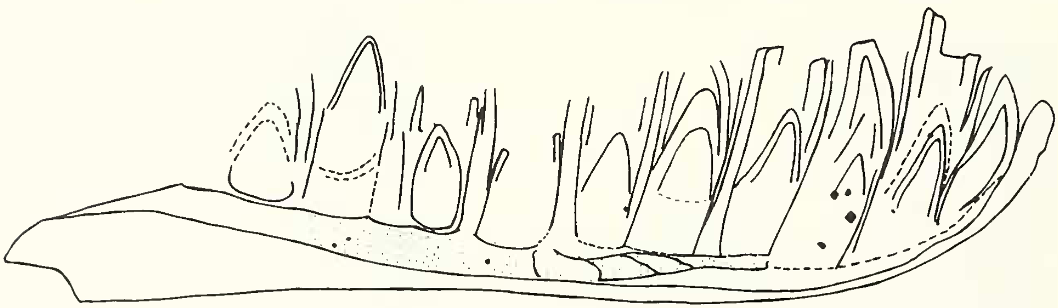
from those of *M. bucklandi* in their mode of implantation in the jaws. They stand vertically with the anterior and posterior margins remaining perpendicular to the long axis of the jaw for some way before assuming the usual recurved carnosaur shape. Von Huene's (1926*a*, *b*) description of the teeth is misleading, stating that the teeth are thicker towards their anterior margins than those of *M. bucklandi*, and, by implication, that no anterior serrations are present. Now that the material has been prepared it is evident that these distinctions are invalid. Firstly, there is considerable variation in thickness of the anterior part of the tooth in both species, and secondly, both carinae are clearly serrated where preservation has allowed. This is visible in alveolus three of the right dentary (Pl. 44, fig. 1), and in the replacement teeth.

Successional teeth are visible in crypts on the lingual margin of many alveoli, and the tracing of a radiograph (text-fig. 1) shows the position of old tooth shells,



TEXT-FIG. 1. A drawing made from a radiograph of the right dentary of *Megalosaurus nethercombensis*, O.U.M. J.12143/1, to show the presence of successional teeth erupting through the shells of older teeth, ×0·83.

mature teeth, and replacement dentition. The first alveolus of the right dentary bears a tooth with a grossly curved base, which encroaches upon the second alveolus. This is definitely a growth phenomenon rather than a post-mortem distortion.

The dentaries have been arranged in what is believed to be their original relationship (Pl. 44, fig. 6). The result is a narrow jaw, comparable in symphysial angle to that of some tyrannosaurids, and probably also to British forms such as *M. bucklandi* and *M. hesperis*, but completely different from the lower jaws of *Allosaurus*.

The postcranial material is very poorly preserved, and von Huene (1926*a*, *b*) has described and figured the left tibia-fibula (J.1234/2) and the right pubis fragment (J.1234/3). The femora (J.12343/6/7; Pl. 44, figs. 4, 5) are severely damaged, and represented mainly by cavity casts. Little may be said of their morphology, but they are evidently an associated pair.

A single anterior caudal vertebra, J.12343/8 is preserved (Pl. 44, figs. 3, 7) but is missing the neural arch and one face of the centrum. The centrum is slightly oval dorso-ventrally in cross-section and has a facet at the postero-ventral margin for chevron articulation. Well-marked rugae are present on the ventral surface of the centrum close to the chevron facet.

The second vertebra (J.12343/9b; Pl. 44, figs. 8, 9) is more massive than the caudal and its centrum is almost circular in cross-section. The curvature of the centrum toward the one remaining articular face is more marked than in the caudal vertebra, and the ventral rugae are more robust. The articular face is weakly concave as in the caudal vertebra, and only crushed fragments of the neural arch remain. This is probably a dorsal vertebra from a position immediately anterior to the sacrum.

Remarks. It is difficult to comment upon the affiliation of *M. nethercombensis* from this fragmentary material, particularly as it may belong to a juvenile individual. *M. nethercombensis* is distinct from *M. hesperis* on the basis of the number of dentary teeth, even though there are certain resemblances in the form of the teeth and the shape of the dentary. There would appear to be no obstacle to the inclusion of the Nethercomb material (J.12343) within the genus *Megalosaurus*, as suggested by von Huene (1923, 1926*a*, *b*), Swinton (1934), and Delair (1959).

With regard to other so-called species within von Huene's genus Magnosaurus (1932) the following points may be noted. *Magnosaurus*(?) *lydekkeri* von Huene (1932, p. 220) was based on a single tooth ascribed to *Megalosaurus* by Dawkins (in Huxley 1869) to *Zanclodon*? sp. by Lydekker (1888) and to '*Zanclodon*(?)' by von Huene (1926*a*). It may be best regarded as belonging to a carnivorous dinosaur of indeterminable affinity.

In 1908 Woodward described a tibia, B.M.(N.H.) R.3542, from the Lower Lias of Wilmcote, Warwickshire, as a megalosaurid. Von Huene (1908) referred the bone to *Megalosaurus*, and Andrews (1921) in a description of *Sarcosaurus woodi* mentioned that the Wilmcote tibia was probably referable to *Sarcosaurus*, even though no such element existed in his type material. Von Huene (1926*a*) referred the tibia to '*Megalosaurus*' (subgen. a) sp. and in 1932 made the same bone the type of two new species in separate genera, *Sarcosaurus andrewsi* (1932, p. 51) and *Magnosaurus woodwardi* (1932, p. 219).

There is no evidence to support the inclusion of the Wilmcote tibia within the genus *Sarcosaurus*, but there is a close resemblance between the former and the tibia of *Megalosaurus nethercombensis*, as noted by von Huene (1926*a*). I should prefer to transfer the species *S. andrewsi* to the genus *Megalosaurus*.

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